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BOOK REVIEWS

Edited by DAVID I. STEINBERG

The Book Reviews Section is a regular feature of *COMPUTERS & MATHEMATICS with applications*. Reviews are invited of books which are of particular interest to the Journal's readers. A review should ordinarily not exceed two typed (double spaced) pages, and should be approximately 70–50% descriptive and 30–50% evaluative in nature. Manuscripts of reviews as well as books submitted for review should be sent to: Prof. David I. Steinberg, Department of Mathematical Studies, Southern Illinois University, Edwardsville, IL 62026, U.S.A.

Discrete Mathematics in Computer Science. By DONALD F. STANAT and DAVID F. MCALLISTER. Prentice-Hall, Englewood Cliffs, N.J. 1977, 401 pp., $17.50.

An undergraduate curriculum in computer science should have as its goal the teaching of fundamental principles rather than transient technology, while striving to maintain a balance between theory and practical applications. *Discrete Mathematics in Computer Science* by O. J. STANAT and D. F. MCALLISTER serves this need by presenting in a readable manner the basic mathematical principles needed by a computer scientist to understand and intelligently use his tools.

This text is a non-classical introduction to classical mathematics. The chapter on mathematical models mentions the use of models in such areas as computer architecture, operating systems, and computational complexity. A section on program verification concludes the chapter on logic. Sets of strings over a finite alphabet are used to illustrate concepts of set theory. Graphs and trees are introduced as useful data structures in the chapter on binary relations. The notion of recursion is introduced in the chapter on functions. Combinatorics is presented in the context of designing efficient computer algorithms. The usefulness of an algebraic approach to studying the semantics of programming languages motivates the chapter on abstract algebra.

The book is a solid introduction to mathematics in its own right. The treatment of the material is rigorous and thorough. However, the significant contribution of the authors is that they have succeeded in presenting the material in such a way that a student interested in computer science will not lose interest in the mathematics. This is important, since every computer scientist ought to be familiar with the material in this book.

Discrete Mathematics in Computer Science is an ideal text for a second year course in "computer mathematics". Such a course early in the curriculum removes some of the mystery from the more advanced courses and gives the professors who teach those courses an opportunity to cover more material (again, holding the student's interest, since it is always the interesting material that gets slighted in a course). Once the role of mathematics in computer science is recognized, the need for a course in discrete mathematics becomes obvious. The choice of a suitable text for such a course is now easy to make.

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Introductory Applied Statistics in Science by SUNG C. CHOI, Prentice-Hall, Englewood Cliffs, New Jersey, 1978. 278 pp. $15.95.

This is an elementary applied statistics text designed primarily for readers interested in biomedical applications. For the most part, the text is well-written and contains an appropriate selection of topics. The necessary probability background is described in Chapters 1, 2 and 3. Familiarity with integrals (including improper integrals) is required to understand the treatment of continuous random variables. The development in Chapters 2 and 3 is too brief in some places. Replacing discrete sums by integrals does not provide enough motivation for the study of continuous distributions. Continuity corrections are used without explanation. The author erroneously writes $P(a < X < b)$ instead of $P(a \leq X \leq b)$ in the general formulae for the normal approximations of the binomial and Poisson probabilities. Log transformation to achieve normality and the lognormal distribution are discussed well.

Chapter 4 deals with organization of data and descriptive statistics. No distinction is made between the usual class limits and class boundaries. This creates apparent gaps in the histogram and makes the approximation by a continuous curve model questionable. The rest of the book is concerned with statistical inference. General principles and methods are outlined in Chapter 5. It is asserted that the maximum likelihood estimator is determined by taking the derivative of the likelihood function with respect to θ and setting the derivative to zero. This is not true if the likelihood function is strictly increasing or strictly decreasing. The discussion given of P value (the smallest level at which H_0 can be rejected) is extremely useful for understanding computer output from statistical packages. Estimation and testing hypotheses are discussed using frequency data in Chapter 6 and using measurement data in Chapter 7. These chapters (and subsequent ones) contain stimulating biomedical examples and case studies. The problem sections (throughout the book) are valuable for readers who appreciate realistic examples. In Chapter 6, the author discusses some unusual but practically useful topics such as two-by-two tables for paired observations, and the continuity correction of Yates. Chapter 7 contains, in part, a concise but adequate treatment of non-parametric tests. Chapter 8 deals with regression and correlation analysis. Of particular note are short and interesting discussions of the partial correlation coefficient, the contingency coefficient, and non-parametric rank correlation. The analysis of variance is treated in Chapter 9. Included are fixed effects as well as

random effects and mixed effects models for the one-way and two-way classification ANOVA. Of special significance are useful remarks for the practitioner on missing data, the treatment of nested classification and an elegant introduction of the analysis of covariance. Chapter 10 introduces the important topic of computer analysis of data using statistical packages. Three case studies are given to illustrate typical step-by-step methods of interpreting and analyzing computer printouts (from the BMD package).

For a practically-oriented text, a short introduction to experimental designs (randomized block designs, Latin squares, etc.) is lacking. However, elimination of the effects of extraneous factors by pairing observations is stressed by the author.

Overall, the important topics for application are covered well. The summary given at the end of nearly every chapter should be especially useful to students. The brief treatment of probability and the concise (although wide) coverage of statistical inference may not be suitable for students with more limited mathematical background than some knowledge of calculus. However, the practical examples in this book may provide motivation for the lackadaisical type, irrespective of background.

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